Jávácska One: Open Source Mobile Games to Revolutionize Education of Programming

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Abstract *– In this paper, we show three Java ME mobile games, which were created in the framework of industrial projects by a Hungarian mobile game developer company, called Eurosmobil. By the start of 2010 the Eurosmobil will have opened the source code of some of their game software, including these ones. We outline the plans for introducing these games into national and international educational agenda and practice, with particular stress on education of programming. In addition, with this paper we would like to hand over to teachers the symbolic message of our work that the mobile game development may be turned into a new and exciting form of self-expression in the immediate future.*

Keywords: *Mobile game; education of programming; Java ME; mobile game-based learning.*

I. INTRODUCTION

We are convinced that students should write more programs in their educational years. We believe that using open source mobile games in education is a good idea to motivate our students to write their own programs independently [9]. The curiosity of this paper is that, according to the announcement on awards ceremony of *The IT trainer of the year* [27], Eurosmobil has opened the source of some pieces of their game software including the *110% Summer Capital OSE*, or in Hungarian *110% Nyári Kapitális NYFK*, *Soccer Game 4u OSE*, or in Hungarian *Focijáték Neked NYFK* and *Seventh Eye OSE*, or in Hungarian *Hetedik Szem NYFK* [10,11,17]. These games are introduced in this work, with particular stress on educating programming.

A. Background and Motivations

Our motivation stems from the following two main factors: open source and Java mobile gaming.

It is well known that open source is a very important part of the software industry today. And according to some analysts, it will be more important in the future. For example, Gartner said that, in the nearly future, *"80 percent of all commercial software will include elements of open-source technology"* [18].

The open source surrounds us, whatever we are looking for, we are going to find open source codes. We believe this will be true also in education. For example, when teaching the Operating System in the University of Debrecen, the first author usually presents *printk.c* source was written by Linus Torvalds in 1991 to enable writing messages from the kernel level and the same *printk.c* source which is modified by Motorola in 2004 (the "original" file *linux/kernel/printk.c* in the kernel tree can be downloaded from the URL [28], the modified file *linux/kernel/printk.c* can be downloaded from the URL [29]). It is, for example, interesting to note that this latter code is running on my Motorola RAZR2 V8 phone.

The market of mobile games is a very huge and increasing market [19] where almost all devices are Java enabled [20]. Probably almost all pupils, students and teachers have their own Java enabled phones. For example, in Finland after the age of seven years old, children have a mobile phone [22].

It is not enough to open the mobile games in question, we need to care for these games properly. For example, this explains why I created a developer community in our university, called Debrecen Developer Network, briefly called DDN (the *WebSynergy* portal of DDN can be found in URL [30]).

The DDN aims to create a developer community which is based on our students. Some UML (Unified Modeling Language) use cases for DDN are shown in Figure 1. Students are looking for interesting projects and experiences. Pupils are looking for good universities. Headhunters are looking for skillful

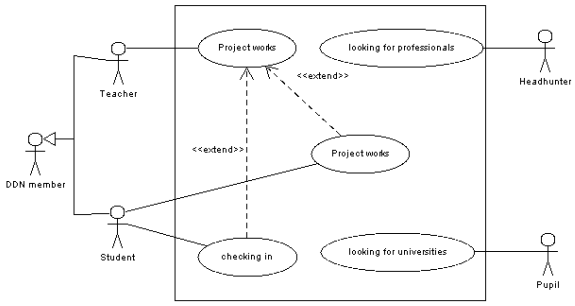

Fig. 1. The use cases for DDN.

programmers. And finally the IT teachers are looking for students who are interested in programming.

B. Related work

Mobile games in education are not at all rare nowadays. There are several projects using mobile devices in education. For example, the works described in [21, 25] focus especially on the mobile game-based learning.

The open source and mobile game based project that is perhaps the closest to our work is the Project mGBL [7]. The mobile games, created within this framework, can be found in SourceForge [8].

C. Our Previous Works

In the Eurosmobil's study [16] the process of developing mobile games was investigated in a Shannon and Weaver's communication model based on Kolmogorov complexity. We had shown that there is nobody who can forecast which games will be good.

We had already created some mobile games for K12 age group within the framework of project Jávácska (in 2003, we created approximately five games and three of these can be found in the wap pages of [16]). The name Jávácska was derived from the Hungarian diminutive of Java. In this project, our main purpose was to develop interesting Java based educational materials (for example LEGO® RIS 2.0, J2ME MIDlet, J2SE Applet and J2EE Servlet Java programs and how-tos) to aid IT teachers. All of this - although only Hungarian - can be found in our informatics vertical portal for children called Jávácska portal [16].

The challenge of the present work is to assist teachers to broaden mobile game based learning for all education age group from K12 to adult education.

This paper is based on the PhD dissertation of the first author [13].

D. Mobile Phone Programming in Java

The Java mobile programmer is an API programmer. The object-oriented world of mobile Java is described by Java Micro Edition (Java ME) which contains two fundamental parts, a profile and a configuration. The configuration, in our case the Connected Limited Device Configuration (CLDC) determines the minimal properties of virtual machine and a core API. The Mobile Information Device Profile (MIDP) built on CLDC supplements it with further APIs like HTTP networking, persistent storage and user interface. But there are further APIs which are very important from a developer's point of view. These are described by Java Specification Request (JSR) documents. For example, if we want to play media files in our Java program we must use the Mobile Media API described by JSR 135. But it is important to note that the CLDC, MIDP and all JSRs are only specifications. We need such mobile phone which implements these standards.

II. THE *OPEN SOURCED* GAMES

The games were created as a business activity by Eurosmobil. It is a small family company specializing in mobile game development based on Java ME platform.

According to our terminology introduced in [15] the game developer works like a transmitter, who codes an experience into a mobile game. Accordingly the mobile games should therefore be decoded by mobile players. In this sense, a player is considered to be a receiver, who decodes the coded experience with the process of gaming itself.

The open source games and related data can be downloaded from the URL [31] and it also released in SourceForge portal under the project name "Javacska One (Jávácska One)" [12]. The games in question are licensed with GNU General Public License (GPL) version 3. In our case the effect of using this license is that if you use our sources released under the GPL you must release your modified sources under the same license. We should remark that the games can be downloaded in only source and as Maven projects.

In the following sections in Figure 2, 3 and 7-12, we show some screenshots of the *open sourced* games.

A. A Fishing Game

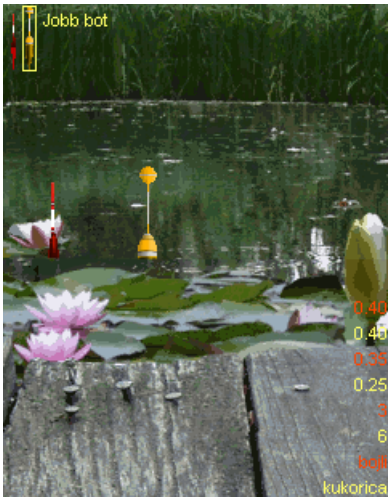

Fig. 2. Fishing in the game.

The experience of ledger and float fishing is coded by the game called "110% Summer Capital OSE", or in Hungarian "110% Nyári Kapitális NYFK". This game is a MIDP 2.0 / CLDC 1.0 application that also uses JSR 135 Mobile Media API.

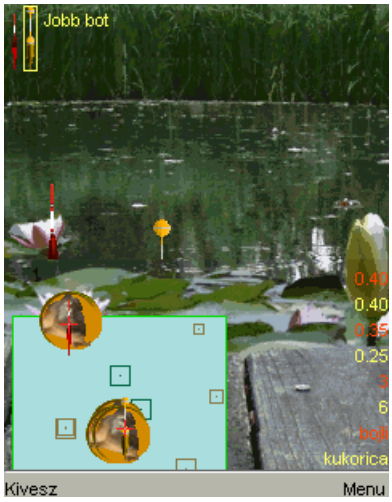

Fig. 3. The fish radar.

Some Special Features

1) Angler is amused by switchable MIDI (Musical Instrument Digital Interface) chirping bird.
2) Introduction of fishes may be done anytime.
3) 5 lines, 6 leader, 12 hooks and 17 baits.
4) The interpretation of 110% is the more realistic fishing, for example, if you use a weak rig, the line might break during playing the fish.

B. *The Organization of Source Codes*

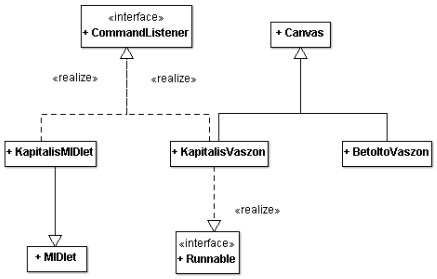

Fig. 4. The OO architecture of the fishing game.

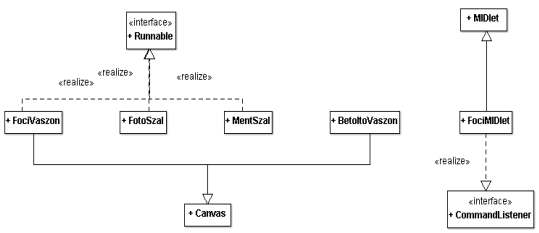

Fig. 5. The soccer game uses a similar OO architecture.

As is regularly the case in practice of mobile programming, we have used a fairly simple object-oriented structure shown in Figure 4-6. These UML class diagrams (created by ArgoUML) demonstrate that the *open sourced* games have similar construction, so these may be explained simply.

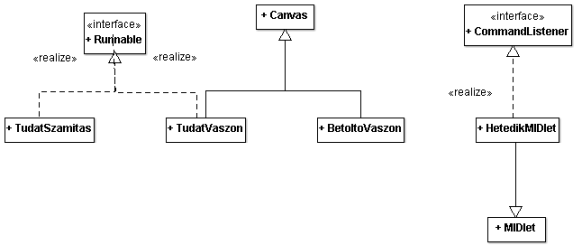

Fig. 6. The esoteric game also uses a similar structure.

C. *A Soccer Game*

The experience of playing football is coded by the game called "Soccer Game 4u OSE", or in Hungarian "Focijáték Neked NYFK". This game is a MIDP 2.0 / CLDC 1.0 application. This game was presented in detail in the former paper [1] and related work are introduced in [2, 3, 4].

D. *An Esoteric Game*

The experience of relaxing and fantasizing is coded by the game called "Seventh Eye OSE", or in Hungarian "Hetedik Szem NYFK". This game is a MIDP 2.0 / CLDC 1.1 application, that for example also uses floating-point numbers.

Fig. 7. The main screen of the *Seventh Eye*.

In this game, the players can create and compare "mental fingerprint" of their friends.

The game implements a *free will probe*, but it is worthy of further introduction, because their operation is not straightforward. The idea of the game was suggested by Kornhuber and Libet's results on the timing of consciousness [23, 24]. Our program works with 2048 pieces of time slices of 100 milliseconds. If the player presses the fire button in a given time slice of 100

milliseconds we set the corresponding bit to 1, otherwise it is set to 0. That is, in our interpretation, pressing the fire button is equivalent to voluntary finger movements. The program should compare the resulting 2048-bit samples. The comparison is based on an idea suggested by [26]. The Ziv-Lempel tree is built from the 2048-bit samples and the deviation of length of branches of this tree is investigated.

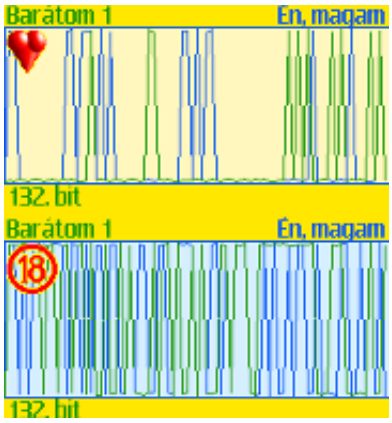

Fig. 8. Mental fingerprints of consciousness.

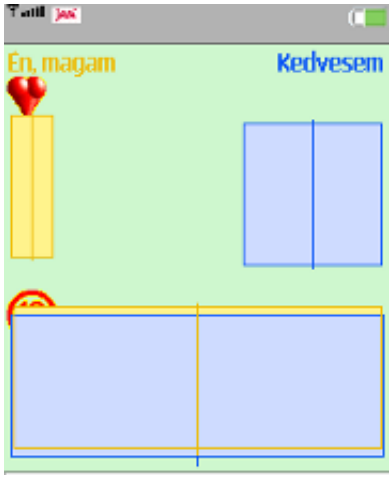

Fig. 9. Comparison of 1^{2048} and a machine sample (top).

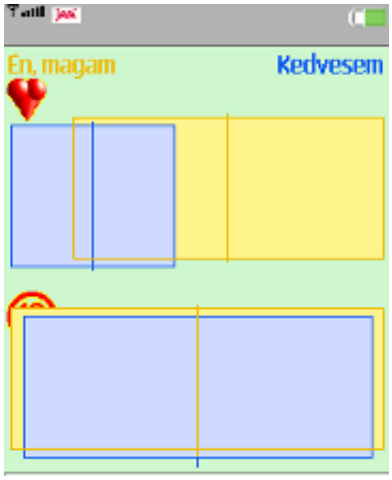

Fig. 10. Box plot of the human and machine patterns (top).

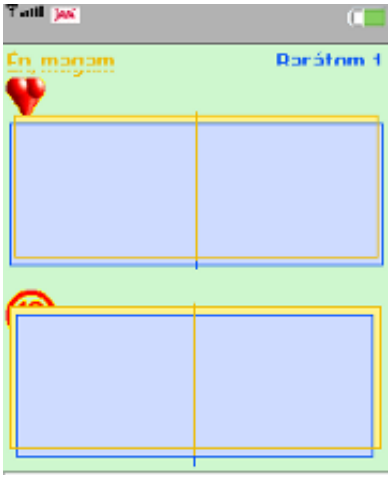

Fig. 11. Two machine samples.

III. INTRODUCING INTO EDUCATIONAL PRACTICES

There are, to date, two education workshops, where it is planned to try the discussed games. Some of them will be introduced in this section. In addition, we outline very briefly the plans for introducing the *open sourced* games into national and international educational practice, with particular stress on educating programming.

A. Use Cases

In this section, we outline some tasks, in relation to *open sourced* games, arranged in order of increasing difficulty.

Fig. 12. A new porting of 110\% Summer Capital OSE: The new fishing place.

1) We can compile Java sources and create the JAD and JAR files. Then these may be loaded to our own mobile phone.
2) We can translate simply the interface of games into an another language, because

only one file contains string literals (these files are the *(nyari | hetedik | foci) /src / main / java / Szoveg.java* files [12]).

3) We can replace the image and audio resources in games. A sample solution [14] of this task is shown in Figure 13.
4) We can modify the Java source of games. For example, a further development of the present *Soccer Game 4u OSE* is shown in Figure 12. In the framework of this work, the soccer game is ported to PC, to the Java SE platform. This development will be mentioned briefly in Section III.

B. School Education

There are several workshops in upper secondary education in Hungary and in Romania where teachers are planning to use our *open sourced* games. These informal connections were built in the conferences INFO Savaria and INFO Éra [10, 17].

C. Higher and Adult Education

The *open sourced* games will be used in the Constantine the Philosopher University in Nitra in Slovakia by Ildikó Pšenáková.

The games in question are used in University of Debrecen in Hungary by the first author. Here in the Operating Systems course, which is mandatory for each System Engineering BSc. students, the aim is to port the *open sourced* games into the Google's Android mobile platform. In addition, the task of Software Engineering MSc. students is to further develop the games in the Mobile programming course.

D. Lecture Notes Book for the Open Sourced Games

Detailed tasks and support materials are available in the lecture notes book [14] which was written to ensure that education could successfully use our *open sourced* games. It was created within the framework of a content development project granted by the *Hungarian National Office for Research and Technology*. This DocBook XML book will be available as soon as possible in the pages of Kempelen Farkas Student Digital Library in the URL http://www.tankonyvtar.hu/.

This lecture notes was written as a follow up to the first author's book [9].

III. CONCLUSION AND FURTHER WORK

With these *open sourced* games we would like to support the pupils, students and their teachers who want to learn. There are at the moment two education workshops, where the work is going on in order to introduce our games. In one year, it may be necessary to summarize the experience which arises during testing of these games in the education practice.

A. Football(er) Simulation Markup Language

At the moment, the Automated Soccer Applet for FerSML (shown in Figure 13) is a further development of the present *Soccer Game 4u OSE*. This development is based on the code of the soccer simulation of our *open sourced* soccer game. The progress of this further development is presented in detail in lecture notes [14].

Fig. 13. A screenshot of the *Automated Soccer Applet for FerSML*.

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